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Project: A 10.2

A Memorandum Report

CYANOGEN CHLORIDE

LC 50 FOR GOATS: 2 MIN EXPOSURE

By

F. P. McGrath

H. A. Sober

S. D Silver

UNCLASSIFIED
Info. Div., CWS Tech. Comd., E.A.

28 March 1944

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By authority of the
Chief, Medical Division,
O-C, C.W.S.

CYANOGEN CHLORIDE

LC 50 for Goats: 2 Min. Exposure

by

F. P. McGrath
H. A. Sober
S. D. Silver

Forwarded to Chief, Chemical Warfare Service

UNCLASSIFIED

Info. Div., CWS Tech. Comd., E.N. [redacted]

CYANOGEN CHLORIDE
LC 50 for Goats: 2 Min. Exposure

Project A 10.2 T.R.L.R. 26

ABSTRACT

OBJECT:

The object of project A 10.2 is to determine the toxicities of standard and proposed chemical warfare agents.

The object of the work described in this report was to determine the LC 50 of cyanogen chloride for goats exposed for 2 min. and observed for 15 days.

RESULTS:

Thirty goats were exposed for 2 min. to various concentrations of cyanogen chloride. Results are tabulated below:

Anal. Concn. mg./l.	Mortality fraction	Mortality %	Time of Death* min.
1.2	1/6	17	35
1.3	0/4	0	-
1.6	0/2	0	-
1.7	1/2	50	5
1.9	1/2	50	10
2.2	7/8	88	7,8,9,9,10,10,10
2.7	2/2	100	10,20
2.8	1/2	50	1
5.1	2/2	100	1,2

*Time after end of exposure.

CONCLUSIONS:

The LC 50 of cyanogen chloride for goats exposed 2 min. and observed 15 days is approximately 1.8 mg./l.

RECOMMENDATIONS:

None.

CYANOGEN CHLORIDE
LC 50 for Goats: 2 Min. Exposure

Project A 10.2 T.R.L.R. 26

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CYANOGEN CHLORIDE
LC 50 for Goats: 2 Min. Exposure

Project A 10.2 T.R.L.R. 26

I. INTRODUCTION.

A. Object.

The object of project A 10.2 is to determine the toxicities of standard and proposed chemical warfare agents.

The object of the work described in this report was to determine the LC 50 of cyanogen chloride for goats exposed for 2 min. and observed for 15 days.

B. Authority.

Work was done by authority of Chief, C.W.S., under project A 10.2.

II. HISTORICAL.

No reliable data are available for short time exposures (less than 5 min.) of goats to cyanogen chloride.

III. EXPERIMENTAL.

A. Materials and Equipment.

Cyanogen chloride of specification grade (96% pure) was obtained from the Protective Development Division, Tech. Command, Edgewood Arsenal.

Goats used as test animals were apparently healthy, and weighed from 35 to 81 lbs., averaging 51.5 lbs. They were selected by Lt. J. F. Brown, V.C.

The 2000 l. goat gassing chamber has been described in T.R.L.R. 20.

B. Procedure.

The gassing procedure was identical with that outlined in T.R.L.R. 25. The animals were observed for 15 days after gassing in order to note any delayed deaths.

Gas-air samples were collected in two bubblers in series containing an alcoholic (70%) solution of 3% sodium hydroxide. The solution was then acidified with 1:1 nitric acid and chloride determined by the Volhard method. Collection was practically complete in the first of the two bubblers.

C. Results.

1. Toxicity.

The results of gassing 30 goats with cyanogen chloride are shown in Table 1.

Table 1

Toxicity of Cyanogen Chloride to Goats:- Exposure 2 Min.

Anal. Concn. mg./l.	Mortality Fraction	Mortality %	Time of Death* min.
1.2	1/6	17	35
1.3	0/4	0	-
1.6	0/2	0	-
1.7	1/2	50	5
1.9	1/2	50	10
2.2	7/8	88	7,8,9,9,10,10,10
2.7	2/2	100	10,20
2.8	1/2	50	1
5.1	2/2	100	1,2

*Time after end of exposure

Essential data from Table 1 are plotted in Chart 1. The LC 50 of cyanogen chloride for goats exposed 2 min. is estimated to be about 1.8 mg./l.

2. Symptoms.

The symptoms exhibited by the gassed animals were primarily those caused by extreme irritation, and were evident almost immediately after the start of exposure. Symptoms appeared in the following order: blinking, eye irritation, lacrimation, violent exhalation, coughing, sneezing, attempts at escape, and finally collapse, accompanied by tonic convulsions. Respiration appeared to be stimulated during exposure. All deaths may be classed as immediate, none having occurred later than 35 minutes after gassing. A thin, frothy, sometimes bloody, fluid was observed to exude from the nostrils and mouths of the goats dying after exposure to CC.

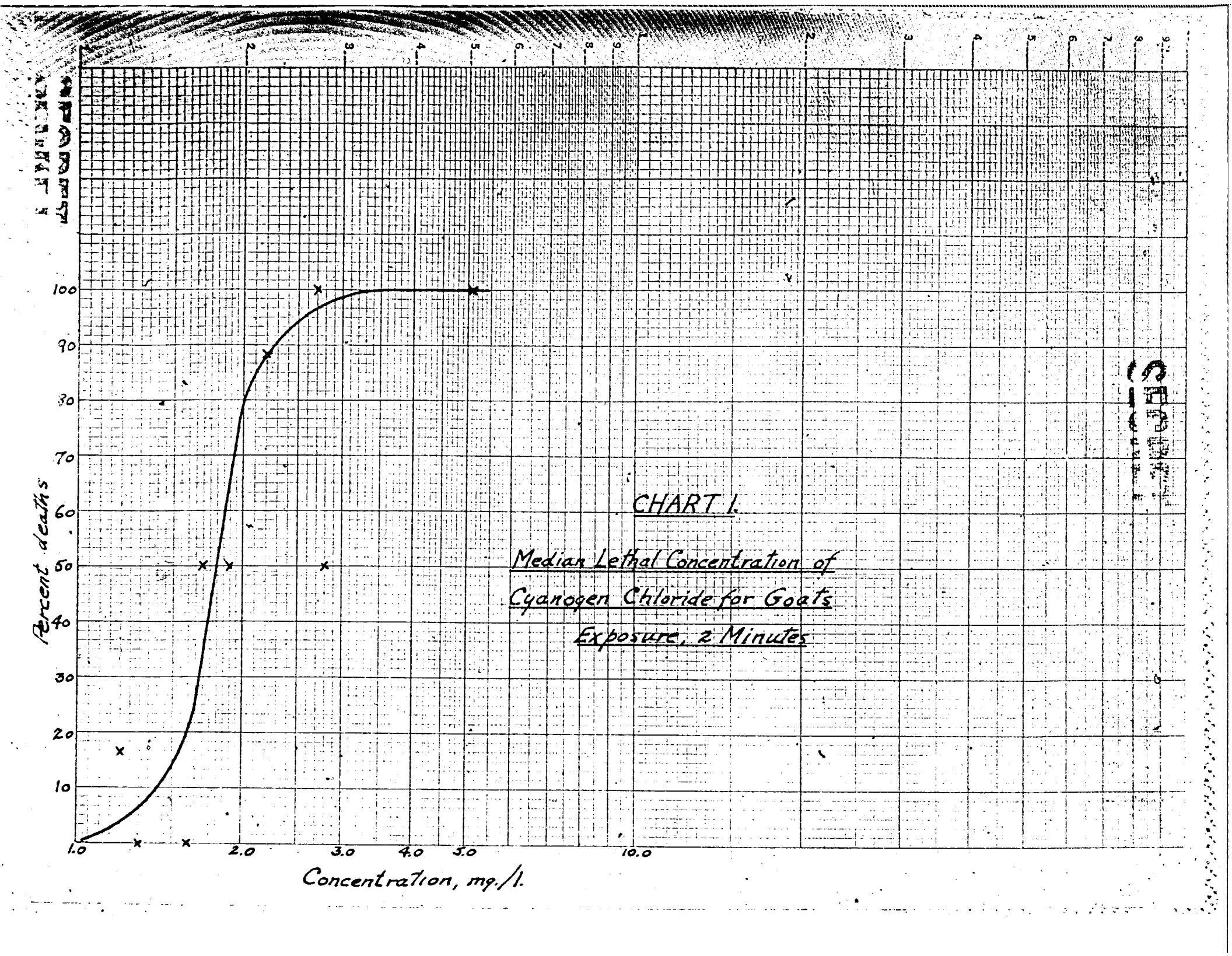

CHART I.

Median Lethal Concentration of Cyanogen Chloride for Goats

Exposure, 2 Minutes

T.R.L.R. 26

UNCLASSIFIED

CYANOGEN CHLORIDE
LC 50 for Goats: 2 Min. Exposure

Project A 10.2

Notebook No. 1827

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Completed: 14 March 1944

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Typed - 14 March - drk

Submitted by:

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DEPARTMENT OF THE ARMY
US ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND
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REPLY TO
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MEMORANDUM THRU Director, Edgewood Chemical Biological Center, (RDCB-D/Mr. Joseph Wienand), 5183 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5424

FOR Defense Technical Information Center, 8725 John J. Kingman Road, Ft Belvoir, VA 22060

SUBJECT: Internal Request for Change in Distribution

1. This action is in response to an Edgewood Chemical Biological Center (ECBC) Internal Request for a Change in Distribution on documents related to cyanogen chloride.

2. The listed documents in the attachment have been reviewed by ECBC Subject Matter Experts and deemed suitable for the change in distribution to read "Approved for Public Release; distribution unlimited."

3. The point of contact is Adana L. Eilo, ECBC Security Specialist, (410) 436-2063, adana.l.eilo.civ@mail.mil.

Encl

MATTHEW A. SPAULDING
Security Manager

Cyanogen Chloride References

[1] Marshall, E.K. and Miller, E.J., *Toxicity of Cyanogen Chloride for The Dog, Rabbit, Guinea Pig, Rat and Mouse on Inhalation,* **Report No. 222** in Marshall, EK ed., **Pharmacological and Research Section Monographs**. War Department Chemical Warfare Service, Research Division, American University Experiment Station, Washington, DC, c. 1918. On file with the Historical Research and Response Team, Research, Development and Engineering Command, Aberdeen Proving Ground, MD. Unclassified, Dist. E, DoD Only.

[2] Miller, E.J. and Gross, J., *Report on G-178 (Cyanogen Chloride),* **CB-183864,** in Marshall, EK ed., **Pharmacological and Research Section Monographs**. War Department Chemical Warfare Service, Research Division, American University Experiment Station, Washington, DC, 18 April 1918. Unclassified, Dist. E, DoD Only.

[3] *Monthly Progress Report,* **CB-186024,** Chemical Corps, Army Chemical Center, MD, 15 June 1944, Unclassified, Dist. E, DoD Only.

[4] McGrath, F.P., Sober, H.A., and Silver, S.D., *Cyanogen Chloride LC 50 for Goats: 2 Min. Exposure,* **CB-015759**, Chemical Corps Technical Command, Army Chemical Center, MD, 28 March 1944, Unclassified, Dist. D, DoD/Contractors Only.

[5] Silver, S.D. and McGrath, F.P., *Cyanogen Chloride, Part 1. Preparation. Part 2. Toxicity: Median Lethal Concentration for Mice,* **EA-TR-341**, Edgewood Arsenal, Aberdeen Proving Ground, MD, 30 January 1942, Unclassified, Dist. D, DoD/Contractors Only.